

0.28 inch, or 0.64 below normal. The rainfall here since January 1 totals only 8.53 inches, 6.97 inches below normal.

Few disturbances of importance occurred during the month. The first to be reported was a small one off the Mexican coast, south of the Gulf of Tehuantepec, which was felt on the 3d to 6th by vessels on the California-Panama route. Its cyclonic character and small size are indicated by the reports of the steamships *Margaret Coughlan* and *W. H. Tilford*, which were in close proximity on the morning of the 5th, southward bound. At 5.40 a. m. (L. M. T.) the former was in  $14^{\circ} 10' N.$ ,  $94^{\circ} 50' W.$ , the latter in  $14^{\circ} 15' N.$ ,  $95^{\circ} 00' W.$  At this hour the *Margaret Coughlan* had a north-northeast wind, force 8; barometer, 29.52. The *W. H. Tilford* had a west wind, force 9; barometer, 29.57. Data for this disturbance are too meager to permit of plotting a path or determining the rate of movement. It is evident, however, from the report of a third vessel, the S. S. *Walter A. Luckenbach*, that the center did not move far between the 3d and 5th. This vessel passed over the same route, also southward bound, two days earlier than the vessels previously mentioned and experienced in the same vicinity overcast, squally weather and rough seas. At 4 p. m. of the 3d the barometer had fallen to 29.53, wind east, 7. This was near  $13^{\circ} 30' N.$ ,  $94^{\circ} 30' W.$  Later the wind veered to SE., continuing from that direction until the morning of the 4th, when it went to S. and SSW., diminishing to force 3.

From the 7th to 9th vessels in the western part of the ocean experienced moderate to fresh southerly and westerly gales, associated with a depression which was then advancing toward the Aleutians and which contributed to the low pressure already mentioned as obtaining in midocean on the 9th to 11th.

On the 27th to 29th vessels east of Japan experienced moderate to strong gales, which seem to have been occasioned by a disturbance that was over northern Japan on the 27th and 28th, and which moved thence in a north-easterly direction. At 8 p. m. on the 29th the barometer on board the S. S. *President Grant*, in  $43^{\circ} 17' N.$ ,  $155^{\circ} 10' E.$ , fell to 28.85 inches. The highest force of wind experienced by this vessel was 9 (SW.).

The S. S. *President Pierce* was involved to some extent in this disturbance. Mr. J. B. Zimmerman, third officer and observer, states that it occasioned an unusual sky display on the 27th. The following is taken from his report:

As the sky cleared in the afternoon a magnificent display of clouds came to view. Sky was bright blue to deep blue overhead. Close to the surface raced detached patches of cumulus clouds from NW. to SE. Above them, SSE. to NNW., traveled another set of broken shreds of clouds, and high aloft, slowly converging from NNW. to a point of the horizon bearing SSE. streamed cirrocumulus and cirrus clouds. At sunset the sight was beyond description. A rosy sunset with all the colors imaginable and the most perfect forms of cirrus clouds I have ever seen.

Other gales reported as occurring at various times during the month are recorded in the accompanying table.

## DETAILS OF THE WEATHER IN THE UNITED STATES

### GENERAL CONDITIONS

"Warm and dry" best characterizes the weather of the month, the important exception being in the Missouri and upper Mississippi valleys and New England where the precipitation was greater than normal. An unusual, for June, hot spell persisted in central and eastern districts during the first 10 days of the month.—A. J. H.

### CYCLONES AND ANTICYCLONES

By W. P. DAY

Low-pressure areas were about normal in number. Several of the more important storms developed over the southern Rocky Mountain region or the Southern Slope, although the associated katabatic winds were sometimes first noted on the Pacific coast.

The high-pressure areas were about normal in number, and about equally divided between the so-called Alberta and North Pacific types. The high of the 9th-12th, which brought an end to the warm wave of the first decade, was apparently built up behind the preceding low merely by the inrush of the cooler and hence denser air near the surface in its rear, and on this account was quite shallow as indicated by airplane observations of temperature secured at Washington on the morning of the 11th. There was a decided lapse in temperature up to about 1,200 meters as compared with the preceding day; but above this elevation a strong inversion existed with no change in temperature. It is also interesting to note that this shallow wedge of cold air underrunning warmer air aloft was not accompanied by precipitation within a radius of more than 200 miles of Washington. Thus the real break in the heat wave over a wide territory came with fair weather.

### FREE-AIR SUMMARY

By V. E. JAKL

Table 1 shows a well-marked positive departure in temperature at Broken Arrow, Due West, and Groesbeck, and a similarly well marked negative departure at Ellendale. At Broken Arrow, Due West, and Ellendale the departures diminished with altitude, indicating that the contrast in temperature between the northern and the southern stations was, to a larger degree than normal for the month, greater in the lower levels than in the upper. Table 2 shows that at Ellendale the winds up to about 2,000 meters had a northwesterly component instead of the southwesterly directions normal for the month. Otherwise there were no important free-air departures in the various averages for the aerological stations.

The departures in temperature and wind at Ellendale are significant in connection with the unusual amount of precipitation at that station. In order to emphasize the distinguishing feature of the free-air conditions in their bearing on this precipitation comparison will be made with the aerological record at Due West, where the precipitation was distinctly deficient. The comparison supports a conclusion brought out in last month's (May, 1925) free-air summary, viz, that in so far as temperatures within the usually observed range of altitude are concerned high lapse rates are not necessarily the precursors of precipitation; also that when lapse rates equaling the dry adiabatic occur they are by no means always productive of heavy or even measurable amounts of precipitation.

Note should be made of the average lapse rate at Ellendale and Due West in Table 1, where, from 500 meters to 3,500 meters, Due West has a rate of  $0.73^{\circ}$ , and Ellendale,  $0.52^{\circ}$ . From individual observations and